



The Society of Interventional Radiology Practice Guidance Document on Venous-Origin Chronic Pelvic Pain in Women

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ABSTRACT

The Women's Health Clinical Specialty Council and Venous Clinical Specialty Council of the Society of Interventional Radiology (SIR) formed a workgroup in collaboration with the SIR Guidelines and Statements Division to create up-to-date society-based consensus recommendations for the diagnosis and treatment of venous-origin chronic pelvic pain in women. This practice guidance document serves as a summary of what is required to treat women with this condition, including preprocedural imaging, treatment options, complication management, and follow-up care.

ABBREVIATIONS

CPP = chronic pelvic pain, CT = computed tomography, DVT = deep vein thrombosis, IVC = inferior vena cava, LRV = left renal vein, MPFF = micronized purified flavonoid fraction, MR = magnetic resonance, NIVL = nonthrombotic left common iliac vein lesion, OV = ovarian vein, OVE = ovarian vein embolization, PeVD = pelvic venous disorder, QOL = quality of life, SVP = Symptoms-Varices-Pathophysiology, US = ultrasound, VO-CPP = venous-origin chronic pelvic pain

INTRODUCTION

Pelvic venous disorders (PeVD) encompass a range of symptoms due to venous reflux and/or obstruction involving the inferior vena cava (IVC), ovarian vein (OV), iliac vein, and/or left renal vein (LRV) (1). Venous-origin chronic pelvic pain (VO-CPP) refers specifically to chronic pelvic pain (CPP) caused by pelvic venous hypertension and is recognized as a clinical presentation within the broader PeVD spectrum of conditions. This document's purpose is to aid in the care of patients with VO-CPP by providing evidence-based information and guidance developed by an expert group consensus after their review of the literature.

METHODS

The Women's Health and Venous Clinical Specialty Councils of the Society of Interventional Radiology (SIR) formed a diverse workgroup to create up-to-date society-endorsed consensus recommendations for evaluating and managing women with VO-CPP. The group decided to develop a best

practice statement document utilizing a modified Delphi process. The consensus guidance statements are based on the available literature. When robust literature was absent, statements were created using a consensus of the workgroup members' expert opinions for best practice. Only statements achieving 80% consensus, with 100% participation in voting, were included in the document.

NOMENCLATURE AND DEFINITIONS

Guidance Statements for Nomenclature and Definitions

1. PeVD is the term that encompasses conditions related to venous issues in the pelvis. VO-CPP is the preferred term, over pelvic congestion syndrome, to define a PeVD associated with CPP.
2. VO-CPP stems from pelvic venous hypertension due to venous reflux or outflow obstruction; in many cases, this is evidenced by dilated periuterine and periovarian varices.

CPP is defined as pelvic pain for greater than 6 months by the American College of Obstetricians and Gynecologists (2). VO-CPP is the most common symptom of PeVD

but refers specifically to chronic pelvic pain of venous origin. The etiology of pain in approximately 80% of patients with CPP will not be gynecologic in origin (3). Although the incidence is not clear, some reports suggest that up to one third of women with CPP may have a venous etiology (4,5).

Historically, symptoms from venous disorders of the pelvis have been described as pelvic congestion syndrome, May-Thurner syndrome (also known as left common iliac vein compression or Cockett syndrome), or Nutcracker syndrome (also known as LRV compression). These terms are imprecise and do not account for the modern understanding of the associated pathophysiology and should be replaced with consensus-developed terminology reflecting the underlying anatomy and venous drainage pathway (6).

PeVD encompasses all symptoms and pathology resulting from abnormal veins of the pelvis, including tributaries such as the LRV, ovarian (gonadal) veins, internal iliac veins, and the veins that traverse the pelvic floor and connect the internal iliac vein and OV branches with those the lower extremities (7) (Fig 1). PeVD manifestations can be due to primary reflux from valvular incompetence or absent valves in these venous segments and/or secondary reflux from obstruction in the IVC, LRV, and iliac veins, leading to pelvic venous hypertension and, in some cases, symptoms (1).

VO-CPP can be due to venous reflux and/or venous outflow compression. Reflux in the OVs and internal iliac veins can cause increased blood pooling in the pelvic venous reservoir. The pelvic venous reservoir in a woman comprises the parametrial, periovarian, perivesical, and uterine arcuate veins, with connections to the veins in the lower extremities and the superficial perineum (Fig 2a–d). The pelvic venous reservoir drains not only the pelvis via the iliac veins and lower extremity veins but also to the IVC by the right OV and through the LRV via the left OV (8). Outflow compression of the left common iliac vein and/or LRV can cause secondary reflux to the left internal iliac vein and left OV, respectively. This can lead to pelvic venous reservoir hypertension, resulting in symptoms of VO-CPP in addition to, or in the absence of, primary venous reflux (9).

SYMPTOMS-VARICES-PATHOPHYSIOLOGY CLASSIFICATION

Guidance Statement for Classification

1. The Symptoms-Varices-Pathophysiology (SVP) classification should be used in clinical assessments and research reporting for precise characterization of the patient's clinical condition.

The SVP classification tool was developed to precisely describe the clinical presentation of patients with PeVD in

relation to their presenting symptoms, location of their varices, as well as their underlying venous etiology and pathophysiology (6) (Fig 3, Table 1 [10]). This discriminative instrument is analogous to the Clinical-Etiology-Anatomy-Pathophysiology classification for lower extremity venous insufficiency (11). Physicians treating PeVD should utilize this classification in clinical practice and as a reporting standard (6). Its use will be critical for future clinical trials and literature to clearly define the included populations and to allow pooling of patients from multiple studies in systematic reviews to help develop the evidence. This will guide evidence-based treatment planning and interventions (12).

CLINICAL EVALUATION

Guidance Statements on Clinical Evaluation

1. Patients with PeVD may have multiple venous abnormalities contributing to their symptoms. Effective treatment plans are dependent on the identification of all of the underlying venous conditions contributing to the patient's presentation.
2. Patients with suspected VO-CPP should be counseled on the various treatment options, including conservative, endovascular, and surgical management.

History

Patients with suspected VO-CPP should be evaluated and counseled prior to any treatment. A thorough pain, medical, and family history should be obtained, as well as associated symptoms and physical examination (Table 2 [13–18]).

Providers should document previous failed treatments for pelvic pain. Patient history should include other comorbidities or possible etiologies for pelvic pain, as well as any primary or secondary neuropsychological conditions that may result in limited response to treatment of PeVD pain generators alone (19). A quality-of-life (QOL) tool should be used to assess the health impact of VO-CPP in women and detect change after treatment.

Physical Examination

Clinical evaluation for the presence of extrapelvic origin varicose veins (V_{3a} and V_{3b}) should be performed in women with CPP as this may further suggest that pelvic pain may be of venous origin. PeVD may lead to primary lower extremity venous insufficiency or persistence or recurrence of varicosities and associated symptoms after successful lower extremity superficial vein treatment if not recognized and treated appropriately (20). These pelvic origin varicose veins, previously described as “atypical” varicose veins, can be found in the inguinal region, medial/posterior thigh (V_{3b}), and/or vulva (V_{3a}) (18,21).

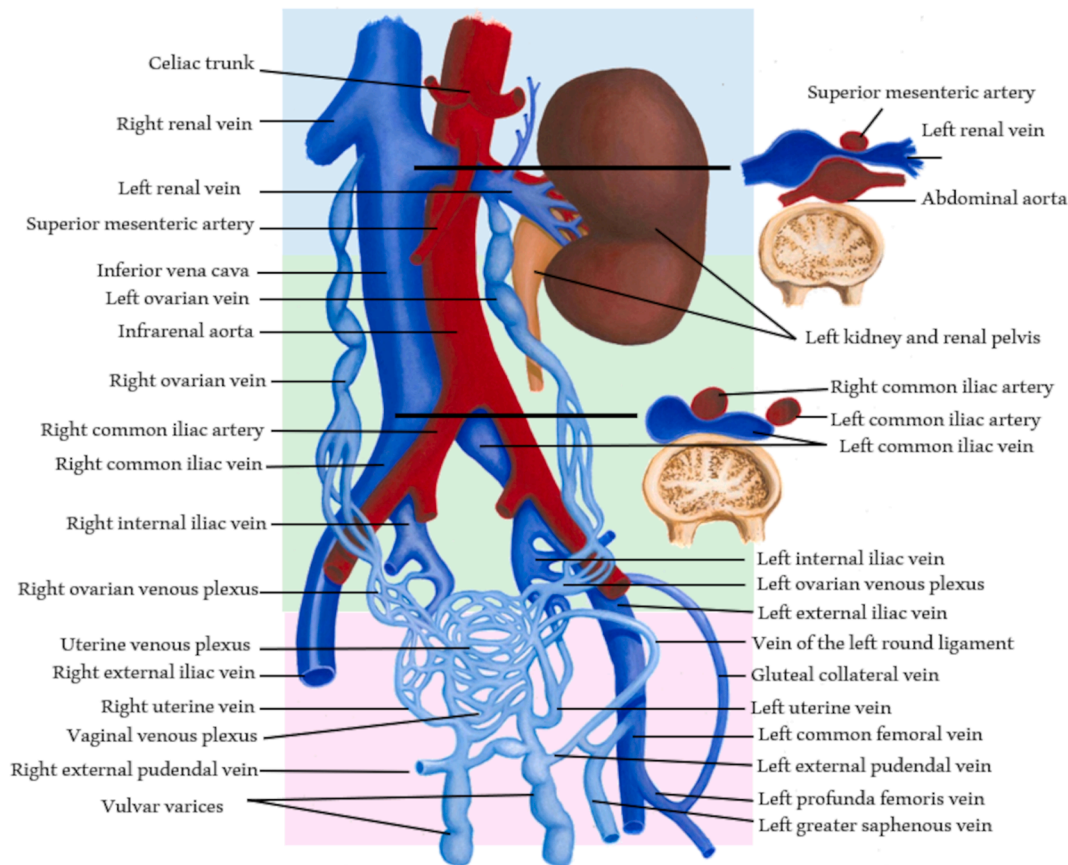


Figure 1. Illustration of the venous anatomy of the abdomen and pelvis demonstrating the cross-sectional view of left renal vein compression between the aorta and the superior mesenteric artery and left common iliac vein compression between the spine and the right common iliac artery.

A thorough physical examination should be performed; this includes a pelvic examination looking for tenderness in the pelvic area (most commonly transabdominally at the ovarian point) and any palpable masses or visible vulvar, labial, perineum, inner/posterior thigh, or inguinal varicosities (22). The symptoms of VO-CPP most resemble those of primary pelvic floor tension myalgia. Distinction from this diagnosis is best performed with a careful physical examination of the musculature of the pelvic floor and pelvic girdle, as well as examination of the uterus, cervix, and ovaries. Typically, women with VO-CPP often have tenderness when their ovaries, uterus, and parametrial structure are compressed, often reproducing their pain. Patients with pelvic floor tension myalgia will not have those findings but will have a high-tone pelvic floor and myofascial trigger points that can reproduce their pain when palpated (23). However, the presence of pelvic floor myofascial pain does not exclude VO-CPP, as myofascial tenderness and pain can result from central sensitization caused by an alternative primary pain generator, such as VO-CPP.

Examination of the lower extremities may reveal signs of chronic venous insufficiency, including varicose veins,

edema, corona phlebectasia, and changes in skin pigmentation. Particular attention should be focused on varicose veins derived from one of the pelvic escape points on the inner thigh, vulvar, and gluteal areas, which would signal venous hypertension in the pelvis. The round ligament vein originates from the inferior epigastric vein connecting directly to the pelvic reservoir.

Imaging

Guidance Statements on Imaging

1. The suspicion of VO-CPP should be confirmed by clinical evaluation, including a comprehensive assessment of the patient's history, physical examination, and imaging.
2. There are currently no published consensus diagnostic imaging criteria for PeVD although imaging findings are crucial to the diagnosis. Catheter-directed venography remains the gold standard. However, noninvasive imaging modalities including ultrasound (US), computed tomography (CT)/CT venography, or magnetic resonance (MR) imaging/MR venography should be used for initial evaluation and procedural planning.

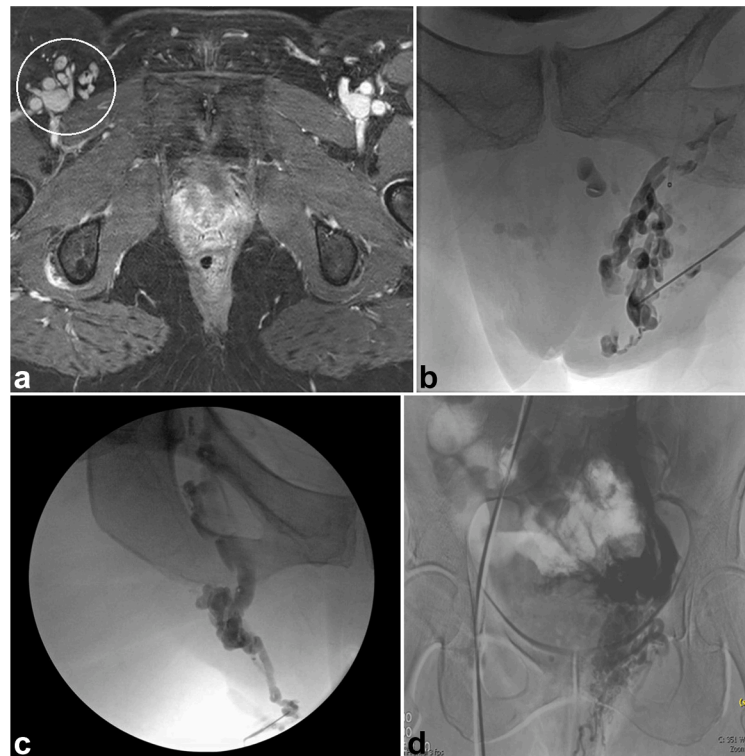


Figure 2. (a) Axial postcontrast pelvic magnetic resonance (MR) imaging demonstrating labial varicosities originated from the great saphenous vein (circle) as an escape point from the pelvis in a patient with venous-origin chronic pelvic pain. (b) Venography performed prior to sclerotherapy in the same patient demonstrating left labial varicosities. (c) Venogram in another patient with venous-origin chronic pelvic pain and right labial varicosities with venogram demonstrating large varicosities in the round ligament extending up to the pelvis serving as venous escape point. (d) Venogram in a third patient demonstrating pelvic derived varicosities.

The first choice for imaging of women with CPP is often transabdominal and/or transvaginal duplex US, as this can assess real-time venous reflux, extrinsic obstruction, evidence of postthrombotic obstruction, deep vein thrombosis (DVT), and pelvic varices. Identification of dilated tortuous pelvic varicose veins with a diameter of >5 mm and reflux supports clinical suspicion of PeVD (6,23,24). CT and CT venography of the abdomen and pelvis with contrast can evaluate venous reflux secondary to venous compression and delineate varicosities in the pelvis; however, it does not assess hemodynamics in real time (5,25). MR imaging and MR venography have the benefit of not utilizing ionizing radiation while providing cross-sectional evaluation for pelvic varicosities and venous compression. Time-resolved imaging has the added ability to assess hemodynamics and venous reflux (25,26). On cross-sectional imaging, a dilated OV of >8 mm with dilated parauterine veins >5 mm is suggestive of PeVD (5). Despite advances in cross-sectional imaging, catheter-directed venography remains the gold standard for diagnosing PeVD due to its ability to assess real-time venous hemodynamics and flow as well as to simultaneously perform intravascular pressure measurements, intravascular US, and provocative maneuvers

(8). The best imaging approach for each patient is based on local expertise and available resources.

Comorbidities of Relevance

Guidance Statements on Comorbidities

1. CPP often includes symptoms suggesting multiple pain generators and can be associated with depression, anxiety, and catastrophizing. Vascular interventionalists should collaborate with providers from other disciplines to address these issues, which may lead to persistent CPP after technically successful venous interventions.
2. Patients with CPP should be evaluated and counseled on the possibility of venous as well as other etiologies for chronic pain.

CPP is often associated with multiple apparent comorbidities, leading to the complexity of diagnosis and treatment. Any primary pelvic pain generator, including visceral pain from distention of veins, may present with symptoms suggesting other visceral and somatic pelvic pain

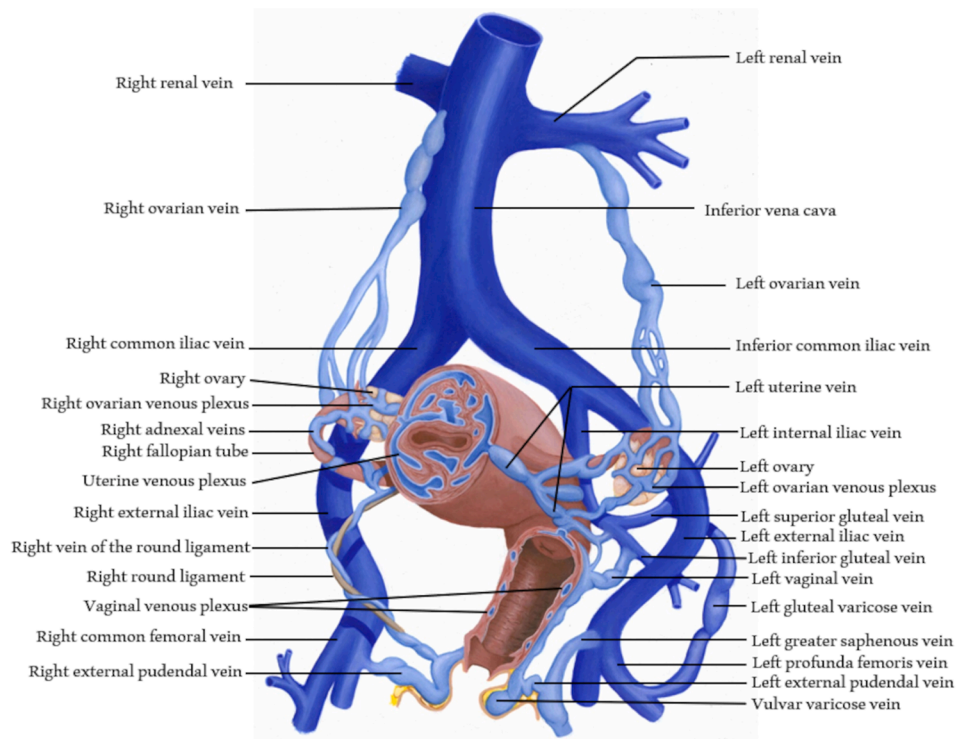


Figure 3. Diagram of the venous anatomy of the abdomen and pelvis including the zones as described by the Symptoms-Varices-Pathophysiology classification.

generators (23,27). Other common pelvic pain generators aside from VO-CPP include pelvic floor tension myalgia, endometriosis, irritable bowel, vulvodynia, pudendal neuralgia, and bladder pain syndrome/interstitial cystitis (19). It is worth noting that some of these can be primary pain generators or secondary to other pain generators, including pelvic reservoir venous hypertension (14,15). The symptoms from these secondary pain generators often persist after successful treatment of the primary pain generator (7,18). Secondary pain generators result from increased sensitization of nociceptors from adjacent visceral organs and musculature in the dorsal horn of the spinal cord and of the nociceptor cell bodies in the dorsal root ganglia. Additional secondary central nervous system structural changes can occur with chronic pain in the midbrain and cortex that adversely affect descending pain inhibitory signals (28). All these mechanisms expand the apparent affected structures and may also amplify the severity of all symptoms. Visceral pain can also lead to myofascial inflammation and trigger point formation in the pelvic floor, resulting in pelvic floor tension myalgia (27). Pelvic floor tension myalgia is a condition characterized by CPP resulting from the involuntary and sustained contractions (myofascial trigger points) of the pelvic floor muscles. This persistent muscle tension can lead to discomfort, urinary and bowel dysfunction, and sexual pain (29).

Depression, catastrophizing, and anxiety disorders are common in all chronic pain patients. The central sensitization and these associated affective conditions can

limit the clinical improvement of affected patients after treating the primary pain generators (18). Patients with PeVD can have postural orthostatic symptoms, and although the precise mechanism for this is not clearly elucidated, secondary small fiber neuropathy and a low flow effect caused by venous dysfunction have separately been proposed (14). Therefore, vascular interventionalists should consider collaboration with and referrals to clinicians and other specialists to address these associated conditions, thereby improving outcomes in patients treated for VO-CPP.

MANAGEMENT OF VO-CPP

Guidance Statements on the Management of VO-CPP

1. Embolization for VO-CPP may include 1 or both OV and/or internal iliac veins as well as liquid/foam embolization/sclerotherapy of the pelvic venous reservoir. No embolization protocol has demonstrated clear superiority in the literature to date.
2. In $S_{2,3}, V_{2,3}$ patients (chronic pelvic pain of venous origin and extrapelvic symptoms of venous origin with pelvic varices and pelvic origin extrapelvic varices in either the vulva or lower extremities), interventional treatment may begin the following procedures based on pathophysiology: OV embolization (OVE), internal iliac vein embolization, and iliac venous stent insertion, often in a staged manner.

3. Left common iliac vein compression or obstruction can result in secondary pelvic venous reflux and result in VO-CPP. Common iliac vein stent insertion can be considered in the appropriate patient.
4. LRV compression can lead to secondary left OV reflux and VO-CPP. An intraprocedural assessment of the hemodynamic significance of the LRV compression prior to OVE is recommended.
5. In S₂ (chronic pelvic pain of venous origin) patients with LRV compression and OV reflux, embolization of the OV is appropriate when pre-embolization OV occlusion does not elevate the renal vein to IVC gradient to >3 mm Hg. Such patients require close clinical follow-up after embolization to ensure that they do not develop S₁ (renal symptoms of venous origin) symptoms necessitating additional treatment.

Conservative/Pharmacological

First-line therapy for VO-CPP is often conservative, typically with either hormonal medication or, more recently, micronized purified flavonoid fraction (MPFF), a venoactive medication. Both medroxyprogesterone and gonadotropin-releasing hormone antagonists have been used to decrease the levels of circulating estrogen, which is postulated to be a possible cause or contributing factor of pelvic venous dilation (3,14,30–32). However, these have been shown to have poor long-term symptomatic benefits and come with unfavorable side effects, including

menopausal symptoms, weight changes, menstrual irregularity, and decreased bone density (8,33). Randomized controlled trials of MPFFs in women with PeVD have demonstrated significant symptom and QOL improvement when compared with placebo (30,31). However, there are no studies comparing MPFF with other invasive interventions.

Endovascular Treatment of Reflux or Obstruction

OV Embolization. Primary OV reflux is a common cause of VO-CPP and has been the most investigated. This can be due to absent or incompetent valves in the OVs, which lead to venous reflux and increased venous pressure in the pelvic reservoir and, in some women, CPP (34). OVE is used to treat both the OV reflux and the resultant varicose veins in the pelvic reservoir. This is often performed as an outpatient procedure with moderate sedation. The access can be from the jugular, femoral, or upper extremity vein approach with sheaths ranging from 5 F to 9 F, depending on the size of the occlusion balloon available and if intravascular US is planned. Curved sheaths can provide stability to the LRV. Evaluation of the internal iliac veins and the pelvic venous reservoir is recommended in all cases, as well as intravascular US, if there is a concern for compression of the left common iliac vein or LRV.

The LRV should be catheterized, and venography should be performed peripherally to the origin of the OV to evaluate for reflux in the left OV, reflux into the pelvic reservoir, and LRV compression (Fig 4a–c). If there is a concern for a significant LRV compression along with OV reflux, intravascular pressure measurements in the LRV and IVC with balloon occlusion of the OV should be performed to assess the hemodynamic significance. It is recommended to proceed with OVE if balloon occlusion of the OV does not elevate the LRV to IVC gradient > 3 mm Hg. If no significant renal vein compression is found, the left OV should be catheterized, and venography should be performed to evaluate for reflux. Multiple maneuvers can be performed to further assess for reflux, such as tilting the table head up, Valsalva maneuver, and balloon occlusion. If it is present, generally, the catheter used is advanced to the top of the sacrum, and another venography is performed to evaluate the filling of and to estimate the volume and drainage of the pelvic venous reservoir (Fig 5a,b).

There are limited data comparing embolization of the OV alone or with sclerosant embolization of the venous reservoir as well. However, combined treatment is the currently recommended technique to maximize potential benefit until data prove that reservoir embolization does not add to the clinical success and durability of the procedure (22,30). Embolization of the pelvic venous reservoir should be performed with a sclerosant, often sodium tetradecyl

Table 1. Clinical Findings for the Symptoms-Varices-Pathophysiology Classification (CC BY: Rezaei-Kalantari et al (11))

Symptoms (S)	
S ₀	No symptoms
S ₁	Renal symptoms of venous origin
S ₂	Chronic pelvic pain of venous origin
S ₃	Extrapelvic symptoms of venous origin
a	Localized symptoms associated with veins of external genitalia
b	Localized symptoms associated with pelvic origin nonsaphenous veins of the leg
c	Venous claudication
Varices (V)	
V ₀	Nonabdominal, pelvic, or pelvic origin extrapelvic varices
V ₁	Renal hilar varices
V ₂	Pelvic varices
V ₃	Pelvic origin extrapelvic varices
a	Genital varices (vulvar varices and varicocele)
b	Pelvic origin lower extremity varicose veins arising from the pelvic escape points and extending into the thigh
Pathophysiology (P)	
Anatomy	Inferior vena cava; left renal vein, gonadal vein, common iliac vein; external iliac vein; internal iliac vein; pelvic escape vein
Hemodynamics	Obstruction (O); reflux (R)
Etiology	Thrombotic (T); nonthrombotic (NT), congenital (C)

Table 2. History for Patients with Suspected VO-CPP	
History	Associated history, symptoms and physical examination findings
Pain	Onset, location, intensity, and character of the pain. Exacerbating activities (pain with or after intercourse or prolonged standing, worse at the end of the day) (13,14)
Associated symptoms	Leg heaviness, swelling, fatigue, vulvar varicosities, and varicose veins
Medical and family history	History of pregnancy, abdominopelvic surgery, deep vein thrombosis, pulmonary embolism, or other personal or family history of venous disorders
Comorbidities/differential diagnosis	Pelvic floor tension myalgia, endometriosis, irritable bowel, vulvodynia, pudendal neuralgia, anxiety, depression, interstitial cystitis, bladder pain syndrome/interstitial cystitis, central sensitization, anxiety, depression, allodynia, fibromyalgia, chronic fatigue/myalgic encephalomyelitis, chronic migraines, and autonomic dysfunction such as postural orthostatic tachycardia syndrome (14–17)
Concomitant or secondary neuropsychological conditions	Central sensitization, anxiety, depression, allodynia, fibromyalgia, chronic fatigue, chronic migraines, and autonomic dysfunction such as postural orthostatic tachycardia syndrome (14–18)
Prior conservative treatments attempted and clinical response/relief	Physical therapy (specifically pelvic floor physical therapy), NSAIDs, hormonal augmentation, ovarian suppression, and nerve blocks
Prior endovascular or surgical intervention	Embolization, stent placement, nerve stimulators, nerve ablation, hysterectomy, renal vein transposition, gonadal vein transposition, renal autotransplant, and varicose vein treatments

NSAID = nonsteroidal anti-inflammatory drug.

sulfate, although polidocanol can also be used with limited data to suggest one agent over another (35). The sclerosant should be mixed with contrast to allow for continuous fluoroscopic visualization during sclerotherapy or monitored with a subtraction angiographic technique to prevent nontarget embolization. The sclerosant can be injected through the balloon occlusion catheter in the distal gonadal vein either as a liquid or as a foam, with or without added gelatin sponge, to fill the pelvic venous reservoir and cross pelvic collaterals while monitoring for nontarget embolization into the gonadal veins or the internal iliac vein outflow. Following sclerotherapy, mechanical embolization of the gonadal vein should then be performed, often with coils oversized by approximately 20%, although this may

vary depending on the coil of choice (Fig 6). The coil embolization technique varies from loose coil packs throughout the entire gonadal vein to intermittent, tighter coil packs. There is no strong data to favor one technique over another. Care should be taken to stop embolization at a safe distance from the origin of the renal vein and cover the origin or separately embolize potential parallel branches of the gonadal vein, which can also fill the pelvic reservoir and lead to treatment failure. Completion venography should be performed from the LRV to ensure technically successful embolization with appropriate position of the coil pack.

The right OV should then be catheterized. This can be difficult in cases where the right OV is not dilated at its

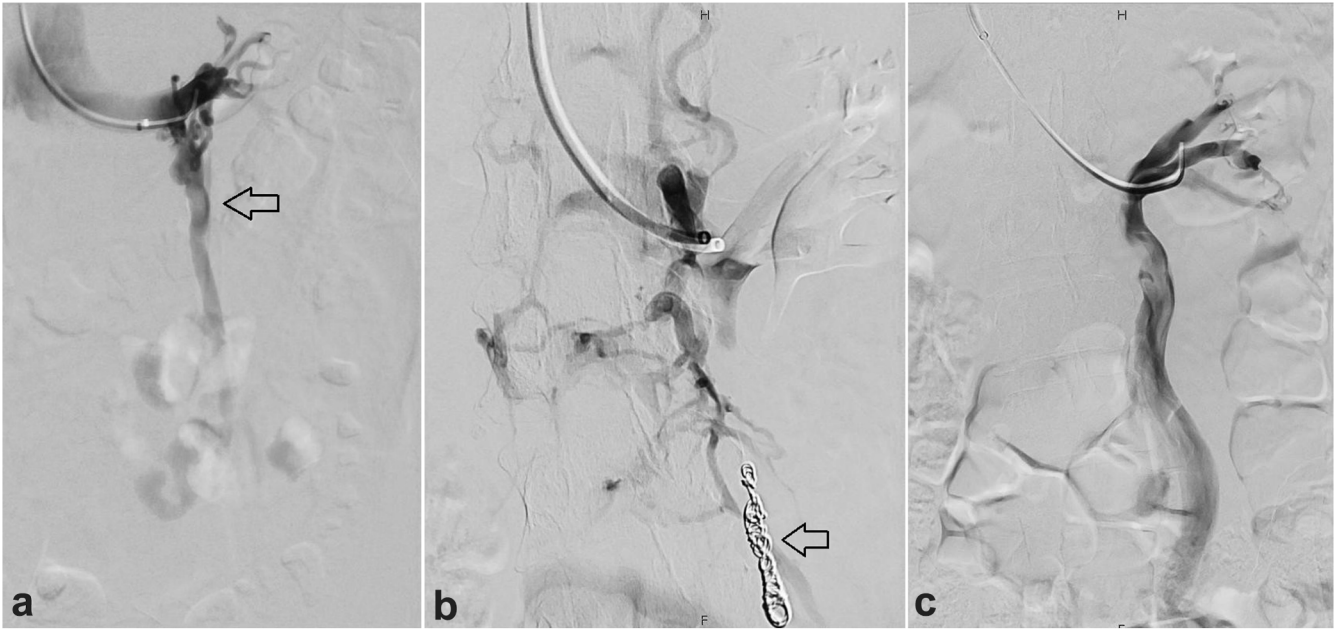


Figure 4. (a) Left renal venogram demonstrating reflux of contrast into the left gonadal vein (arrow). (b) Left renal venogram in a patient with prior left gonadal vein embolization demonstrating successful embolization with extensive perihilar collaterals and filling of the lumbar plexus. Arrow, coils from prior embolization. (c) Left renal venogram demonstrating findings of left renal vein compression with retrograde filling of the left ovarian vein as the primary outflow.

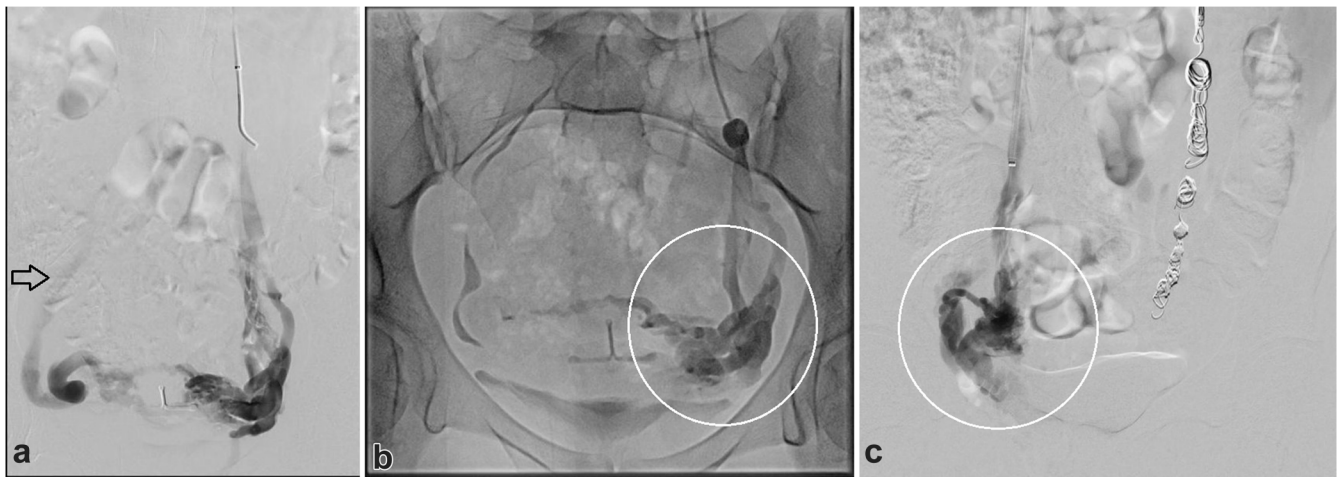


Figure 5. (a) Venogram from the left gonadal vein in a patient with venous-origin chronic pelvic pain demonstrating reflux of contrast and filling of the parametrial veins with outflow into the right internal iliac vein (arrow). (b) Venogram in the same patient with balloon occlusion demonstrating filling of the pelvic venous reservoir (circle) from the left distal gonadal vein. (c) Venogram in another patient with venous-origin chronic pelvic pain from the right gonadal vein demonstrating filling of the pelvic reservoir (circle).

outflow. Careful examination of cross-sectional imaging should be performed prior to the procedure to aid in localization. This can require multiple different catheter shapes, including multipurpose angiographic (MPA) or

reverse curve catheters. Once catheterized, venography should be performed to assess for valvular incompetence and reflux, as well as filling of the pelvic venous reservoir. If reflux is seen or if filling of the varicose pelvic reservoir is seen even without OV reflux, embolization is performed in a similar fashion; there may be value in sclerosing the pelvic venous reservoir that fills from the right OV, even if the right OV is competent on venography. It is also worth considering that a competent right OV found on pre-embolization imaging may become incompetent once embolization of other sources of reflux to the pelvic venous reservoir begins.

The literature is varied, and there is no strong evidence regarding the timing of sclerotherapy/embolization from a staged approach starting with a single or both OVs versus single-session 4-vessel embolization of the ovarian and bilateral internal iliac veins (36). Internal iliac balloon occlusion venography is recommended after embolization of the gonadal veins to evaluate for residual filling of the pelvic venous reservoir; balloon occlusion is more likely to opacify varicose veins than a simple end-hole catheter injection would. Additional sclerotherapy can be performed again using the sclerosant in liquid or foam consistency through a balloon occlusion catheter (Fig 7a–d). The balloon should be left inflated after injection to allow for successful sclerotherapy prior to removal, typically 5–15 minutes. Coils can be used in the internal iliac veins; however, with adequate sclerosis of the varicose pelvic venous reservoir, they can be avoided due to the higher risk of coil and/or plug migration after embolization (35).

Left Common Iliac Vein Compression.

Nonthrombotic left common iliac vein lesion (NIVL) can lead to secondary reflux into the pelvic reservoir and pelvic venous reservoir hypertension due to outflow obstruction. This may occur alone, or it may be seen in conjunction with



Figure 6. Fluoroscopic image demonstrating coils in bilateral gonadal veins.

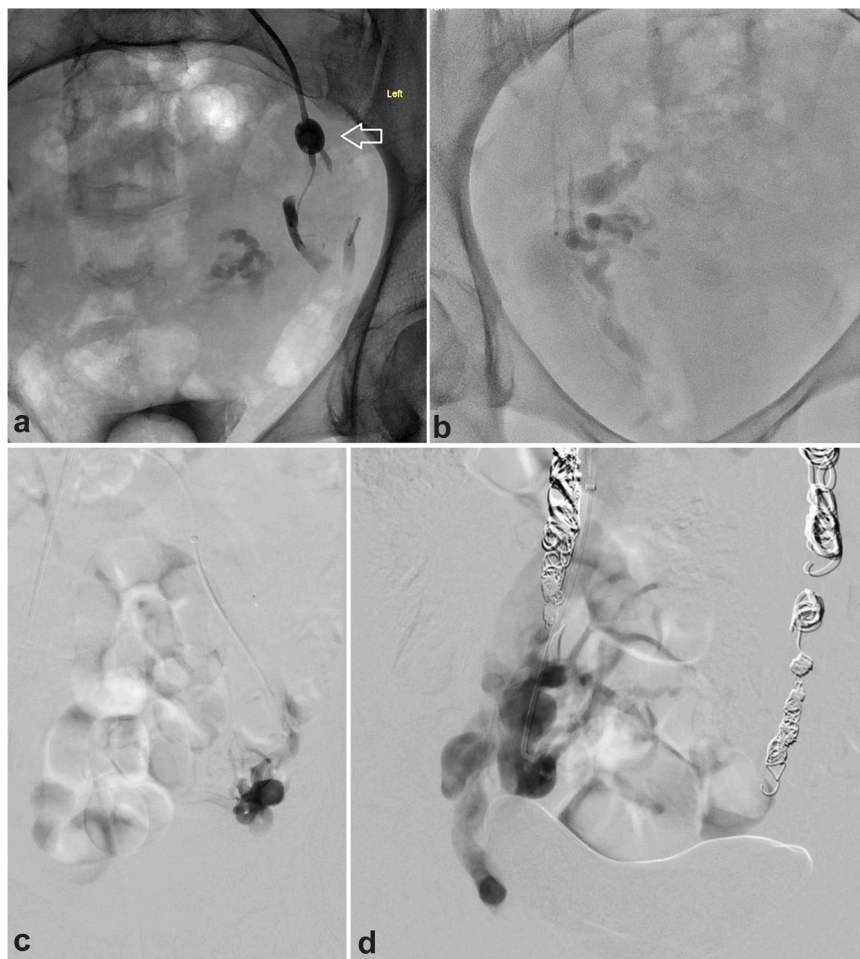


Figure 7. (a) Fluoroscopic image with left internal iliac balloon occlusion and sclerotherapy of pelvic reservoir off the internal iliac vein in a patient with prior renal autotransplant with recurrent pain and pelvic varices originating from the internal iliac vein. Arrow, balloon occluding the internal iliac vein. (b) Venogram in the same patient of varices originating from the right internal iliac vein. (c) Venography performed with left internal iliac balloon occlusion in a patient with renal vein transposition with recurrent venous-origin chronic pelvic pain and varices originating from the internal iliac vein. (d) Right internal iliac venogram in a patient with venous-origin chronic pelvic pain worse on the right demonstrating large varices draining into the external iliac vein. Note coils from prior embolization therapies.

OV reflux. There are conflicting opinions, limited literature, and low levels of evidence to guide treatment algorithms in this setting related to the timing of OVE versus common iliac vein stent placement when both are present (14,37–42). Careful selection of patients is crucial prior to endovascular intervention and stent placement, as up to 70% of asymptomatic people will have nonthrombotic left common iliac vein compression, and only a subset of these patients may experience VO-CPP relief after stent placement (41). The degree of OV reflux and venous compression can help guide treatment when they are found together. Left common iliac vein stent placement is not without risk of complications, including persistent back pain, stent migration, and thrombosis. Recent recommendations support the use of longer stents (>120 mm) in nonthrombotic iliac vein compression due to the higher risk of stent migration likely from the undamaged vessel intima when compared with thrombotic disease (41,42).

Anticoagulation or antithrombotic medications are commonly used after stent placement for NIVL without quality evidence evaluating its benefit. Use of these medications should be individualized based on the patient's prior history, anatomy, and the technical outcome of the procedure until such data are obtained.

LRV Compression. A thorough evaluation for LRV compression should be performed prior to embolization of OV reflux. In addition to preprocedural duplex US and venography, this can include intravascular US, intravascular pressure measurements, balloon occlusion venography, and pressure measurements, as discussed in a previous section. In the setting of significant LRV compression, a multidisciplinary discussion and shared decision-making with the patient are recommended prior to treatment of LRV compression, including stent placement, due to the risk of complications, such as stent migration (43,44).

Treatment for Combined Reflux and Obstruction Associated with VO-CPP

Combined Primary Reflux and Reflux Secondary to Common Iliac Vein Compression, Nonthrombotic.

Although no high-quality studies have specifically assessed endovascular treatment of women with VO-CPP with combined patterns of reflux and venous obstruction, some interventionalists choose to perform OVE first with common iliac vein stent placement considered later in patients with persistent symptoms. However, there are others who feel that the improvement after stent insertion is more impactful than following OVE. Part of the challenge in determining the optimal treatment algorithm relates to the lack of understanding the physiologic mechanism responsible for VO-CPP when patients present with both obstruction and reflux, as well as a lack of quality treatment outcome evidence to drive such treatment decisions. Although most published data on iliac vein stent insertion are for treatment of chronic lower extremity venous disease, there have been recent publications suggesting the effectiveness of iliac venous stent placement in women with VO-CPP (9,17,37,38,45). Regardless, it is debated whether stent placement of the iliac vein alone leads to the successful resolution of CPP or if other interventions, such as OVE, are necessary to provide significant clinical improvement (38,40,46).

Several retrospective studies have investigated the timing of OVE versus iliac stent placement in patients with VO-CPP with combined reflux and iliac vein compression. One retrospective review study (38) found that only 9 of 94 patients who underwent planned staged OVE first and then iliac stent placement for VO-CPP with iliac compression and reflux had symptomatic improvement after OVE alone. A smaller (n = 12) retrospective study (40) examined patients with iliac vein compression, OV reflux, and VO-CPP who underwent iliac vein stent placement as a primary therapy. They found that only 16.6% of patients experienced symptom relief with stent placement alone. The majority underwent subsequent OVE with improvement in symptoms (40).

In a study (47) of 43 women with VO-CPP, patients were evaluated with the following anatomical distribution and etiology for symptoms: OV reflux (61%), internal iliac

vein reflux (9%), reflux combination of both (30%), and 42% of patients with anatomical obstruction (IVC, common iliac vein, or LRV). These patients subsequently underwent treatment with OVE (86%), internal iliac vein embolization (9%), and venous stent placement (35%). After treatment, 93% had subsequent improvement in the leading symptom of pelvic pain, with 14 (33%) symptom-free (47).

Lastly, a small retrospective study (39) of 38 women with VO-CPP from coexistent OV reflux and common iliac vein compression found that 76% of patients achieved complete symptom resolution with iliac vein stent placement alone, regardless of whether there was a persistent pelvic venous reservoir leading to the authors recommending that iliac vein stent placement alone should be the primary treatment, with staged OVE only in cases of persistent symptoms.

A consensus statement from the VIVA Foundation, the American Venous Forum, and the American Vein & Lymphatic Society acknowledges the potential value of iliac vein stent insertion to palliate VO-CPP, leading to a recent recommendation that stent placement may be reasonable in selected women with symptoms of VO-CPP and NIVL (Table 3) (9).

In summary, in symptomatic patients, when the symptoms can be directly attributed to the stenosis, stent placement of the NIVL can be considered either alone or with other endovascular interventions, such as OVE, after careful workup, including review of history, medical workup, and imaging. However, this decision should be made thoughtfully, given that there is a high prevalence of iliac vein stenosis in asymptomatic patients. Based on current evidence, it is difficult to determine the degree of stenosis for which stent insertion improves VO-CPP symptoms, and to date, there are only case series but no comparative effectiveness studies to support stent insertion for this indication.

Left OV Reflux Secondary to LRV Compression.

The management of combined LRV obstruction and OV reflux is controversial. LRV obstruction may be compensated by left OV incompetence. However, there is evidence to suggest that apparent physiological LRV obstruction as the cause of OV incompetence may be an overdiagnosed

Table 3. VIVA Foundation, the American Venous Forum, and the American Vein and Lymphatic Society Consensus Recommendations for Iliac Vein Stent Insertion (9)

1. Stent placement for NIVL may have a role in some cases with QOL-impacting VO-CPP in the presence of dilated parauterine veins with or without pelvic venous reflux
2. Dynamic intravascular US evaluation of NIVL is recommended; this includes breath hold and maneuvers that increase intra-abdominal pressure, as well as moving patients into the left lateral decubitus or head up positions. Fixed lesions are more likely to be pathological, whereas dynamic compressions vary with such maneuvers and are less likely to be pathological.
3. Using thresholds of >50% area reduction or >61% diameter stenosis on intravascular US at the NIVL is correlated with symptom improvement following venous stent placement in patients with lower extremity advanced venous disease. Intervention below the stated thresholds is not recommended for VO-CPP.

NIVL = nonthrombotic left common iliac vein lesion; QOL = quality of life; US = ultrasound; VO-CPP = venous-origin chronic pelvic pain.

cause of S_2 (VO-CPP), as a patient's position during imaging can significantly impact the degree of LRV stenosis visualized on intravascular US. Most of the renal vein obstructions found when imaging with intravascular US with the patient supine are relieved when the patient is moved to the left lateral decubitus or into sitting positions. When significant stenosis is defined as a decrease in the cross-sectional area of the vessel by 60%, in the supine position, 55% of patients were significantly stenosed, compared with only 10% of patients when lying on their left side but an increase to 67.5% when standing (48).

If patients are presenting with severe, predominantly renal symptoms (S_1), typically with no collateral flow to compensate for the obstruction, surgical options or LRV stent placement could be considered. However, if pelvic pain (S_2) symptoms of PeVD are present without renal symptoms (S_1), typically with significant left OV reflux, it seems reasonable to consider if OVE can be performed if no gradient develops between the renal vein in the renal hilum and the IVC when the compensatory flow through the OV is occluded with a balloon. This is further supported by studies showing that LRV stenosis does not appear to negatively impact renal function (40). Overall, LRV interventions should be reserved for patients with severe, recurrent hematuria and/or incapacitating left flank pain (S_1) in spite of all conservative measures or S_2 women with significant LRV to IVC gradients when a refluxing left ovarian is temporarily occluded with a balloon.

ENDOVASCULAR MANAGEMENT OF VULVAR VARICOSE VEINS

Guidance Statement on the Endovascular Management of Vulvar Varicose Veins

1. Treatment of symptomatic vulvar varicose veins should be determined by the patient's dominant clinical symptoms. For isolated vulvar varicose veins without abdominal or pelvic pain (S_{3a}, V_{3a}), it is most appropriate to treat just the vulvar varicosity percutaneously without pelvic venous embolization. For patients with concurrent clinically significant (lifestyle altering, pain that impacts activities of daily living) pelvic pain and vulvar varices ($S_{2,3a}, V_{2,3a}$), embolization of the pelvic venous reservoir can be considered primarily followed by percutaneous sclerosis of the vulvar varices if still needed.

Vulvar varicose veins (V_{3a}) are caused by reflux in the distal tributaries of the internal iliac vein, which communicate with the perineum via pelvic floor escape points. In some cases, they are the result of reflux in a recanalized round ligament vein, which communicates with the OV (Fig 8). Vulvar varices are more common in multiparous



Figure 8. Fluoroscopic image in a patient with venous-origin chronic pelvic pain with injection of contrast from the right ovarian vein demonstrated recanalization of the round ligament vein leading to labial varices (arrow).

women and may present with or without concomitant VO-CPP. They are extremely common during pregnancy but usually regress substantially postpartum.

In women with $S_{2,3a}, V_{2,3a}$, imaging to understand the etiology of the VO-CPP should include detailed venous imaging of the pelvis and lower extremity venous reflux mapping to help determine the etiology and origin of varicosities (49,50). However, in women with isolated S_{3a}, V_{3a} , pelvic venous imaging is not necessary prior to vulvar vein treatment (51).

Treatment should be patient-specific and tailored to the patient's symptoms. Direct stick embolization should be performed in women with isolated S_{3a}, V_{3a} . If VO-CPP is present or if the vulvar veins recur after what was felt to be a technically successful direct stick sclerotherapy procedure, endovascular treatment of the PeVD is appropriate. In this patient population, selective internal iliac venography should be included with and without Valsalva maneuver and/or balloon occlusion to help delineate pelvic contribution to the vulvar varicosities via their escape through the pelvic floor. This will help determine whether and in which veins pelvic embolization is necessary to treat vulvar varicose veins (5).

In patients where vulvar varicosities persist or recur after embolization of the OV and pelvic reservoir, direct stick percutaneous embolization with a sclerosant of the vulvar varices can then be performed. A recent study (52) found 100% technical success of percutaneous embolization in patients with vulvar varicosities after OVE.

SURGICAL INTERVENTIONS

Guidance Statement on Surgical Interventions

1. A multidisciplinary evaluation is recommended for S₂V₂ PLRV,O,NT; LGV,R,NT patients (venous origin chronic pelvic pain associated with a hemodynamically significant left renal vein compression), including surgical consultations to assess potential treatment for left renal vein compression. Embolization of the ovarian vein should be avoided until all options have been discussed, as it may lead to new left flank pain and/or hematuria or renal vein thrombosis, and also since the left ovarian vein may serve as a conduit for ovarian vein transposition.

Multiple surgical interventions exist for the treatment of VO-CPP, which can be tailored depending on the SVP and the cause of patient symptoms. There are limited data available to support these interventions, which can be more invasive with longer hospital stays and increased morbidity when compared with endovascular options. A multidisciplinary approach and discussion are recommended prior to any interventions (53).

Venous Reflux

Laparoscopic Ligation of OV. Since Rundqvist et al (54) reported extraperitoneal resection of the left OV in 1984, various techniques have been described to achieve surgical OV interruption for the treatment of OV reflux. Currently, laparoscopic bilateral transperitoneal OV ligation is the most popular. The results of this surgical technique have been published in a limited number of case reports and series since it was first described in 1995 (55). The largest series included 23 patients followed over a 12-month period with no intraoperative complications and resolution of pain in the 17 patients who completed 1-year follow-up (56–59).

Hysterectomy. CPP remains an indication for hysterectomy with bilateral oophorectomy (60). However, there are limited new data to support this technique. The results of this surgical technique have been published in a case series from 1991, including 36 patients followed over a 12-month period (61). This study showed a gradual decrease in the median visual analog pain score from 10 preoperatively to 0 1 year postoperatively ($P < .001$). Complications, hospital length of stay, and recovery times were not reported (61). Symptoms of VO-CPP can persist or recur after hysterectomy due to the residual venous hypertension in the pelvic reservoir from either iliac vein compression or OV reflux (58).

Venous Obstruction

Most of the data for surgery for LRV obstruction are for patients with S₁; there are limited reports for treating VO-CPP (S₂).

Renal Vein Transposition. For patients with LRV compression, surgical treatment focuses on relieving the anatomic compression. LRV transposition involves reimplanting the LRV to the infrarenal IVC (62). This most commonly has been described via open laparotomy; however, there are case reports of laparoscopic LRV transposition (63). Several case series have been reported, including 8 patients presenting with gross hematuria and flank pain who were followed over a mean period of 66.4 months, of whom 7 patients experienced symptom resolution (64). They reported the following postoperative complications: 1 DVT and 1 ileus that resolved with conservative management (58). Reed et al (62) published their experience of 11 patients, with 9 experiencing improved or resolved left flank pain. There were no early complications. However, 3 patients required reintervention, 2 of whom were due to rethrombosis (58). Because of frequent recurrent compression, there is growing acknowledgment that renal vein transposition is not the best treatment for most significant LRV compressions.

Gonadal Vein Transposition. Gonadal vein transposition involves reimplanting the distal left OV to the left external iliac vein, left common iliac vein, or IVC. Open and laparoscopic approaches have been described in the literature. The largest case series (65) included 18 patients presenting with pelvic pain and heaviness ($n = 15$), flank pain ($n = 14$), abdominal pain ($n = 2$), pelvic varices ($n = 3$), lower extremity varices ($n = 4$), gross hematuria ($n = 4$), microscopic hematuria ($n = 4$), and proteinuria ($n = 2$). Patients were followed over a median period of 178 days. Eleven patients (61.1%) experienced complete symptom relief, 4 (22.2%) partial relief, and 2 (11.1%) transient relief. They reported a median length of stay of 5 days and the following postoperative complications: 1 transfusion for retroperitoneal hematoma not requiring intervention and 2 postoperative readmissions, 1 for gastrointestinal bleeding and 1 for pain control (65).

Renal Autotransplantation. Renal autotransplantation can be performed via an open or laparoscopic approach, with the left kidney removed and transplanted into the patient's pelvis. There is a multicenter retrospective study (66) that included 105 patients who underwent renal autotransplantation at 2 US transplant centers as a primary or salvage therapy. Patients were followed over 12 months. Excluding 4 patients lost to follow-up, 93.1% experienced complete resolution of flank pain. There was a significant decrease in the number of patients using opioids before (48.6%) and after (17%) transplant, as well as a significant decrease in morphine milligram equivalents (69.2%) at baseline and at the 12-month follow-up. Complications were not reported (66).

IMPACT OF ENDOVASCULAR INTERVENTIONS IN REPRODUCTIVE OUTCOMES

Guidance Statement on Reproductive Outcomes

1. Although there are limited data available, OVE for PeVD is considered safe in women desiring future pregnancy.

Ovarian varicosities associated with PeVD have been proposed to be a possible cause of female infertility. This is thought to be due to venous hypertension and mechanical compression on the ovary by the varicose veins, which leads to decreased ovarian reserve and hormonal changes. It may also be related to the reluctance of affected women to have intercourse due to pain that occurs with it or afterward. Estrogen is known to increase nitric oxide release, which, in turn, leads to venous dilatation and vessel wall weakening (20,67). Similarly, progesterone has been shown to lead to weakening of venous valves (67).

There are limited data available on fertility outcomes after OVE. However, available literature suggests that OVE does not negatively impact fertility and may improve fertility (68). A small study by Liu et al (69) investigated 12 women with infertility from PeVD; all other causes of infertility were excluded. Eight of the 12 patients became pregnant in the follow-up period of 24–36 months, 6 of whom were carried to term and had a live birth. Luteinizing hormone and follicle-stimulating hormone were measured before embolization and 3 months after embolization with no significant difference (69). Kim et al (70) also published a study finding no significant difference in follicle-stimulating hormone, luteinizing hormone, and estradiol after OVE. Dos Santos et al (71) reported 8 women who successfully became pregnant after embolization. There are no reports of coil displacement in women who become pregnant after embolization. Several other small studies and case reports have also reported successful pregnancies after embolization (72,73).

COMPLICATIONS OF ENDOVASCULAR INTERVENTIONS

Guidance Statement on Complications

1. The most common complication of ovarian and pelvic venous embolization is postembolization syndrome, consisting of low-grade fever and pain in the pelvis, abdomen, or back. Symptoms are nearly always self-limited and adequately relieved with conservative management. Other severe complications, including coil migration and pulmonary embolism, are rare.

Gonadal vein embolization is often well tolerated. The most common complication is postembolization syndrome, including low-grade fevers and pain in the pelvis, abdomen, or back. This has been reported in approximately 20% of patients after embolization (74). Other minor complications include access site hematoma, OV perforation, or back discomfort (35). Major complications are uncommon and include migration of embolic, DVT, and pulmonary embolism (58,75). Nontarget coil embolization (migration) is more commonly seen with embolization of the internal iliac veins or with large veins measuring >12 mm with reported rates of 3%–4% (76).

PATIENT FOLLOW-UP AND ASSESSMENT OF TREATMENT RESPONSE

Patients who undergo endovascular treatment of VO-CPP should be clinically followed after the procedure. This often includes a short-term follow-up to evaluate for any procedural complications and long-term follow-ups to assess clinical response often performed at 3, 6, and 12 months after the procedure (76). QOL tools are recommended to assess changes in symptoms after the intervention. Follow-up imaging may be needed, especially in patients with persistent symptoms or poor response to treatment or in those for which staged treatment was considered.

CONCLUSIONS AND FUTURE RESEARCH AREAS

Guidance Statement on Conclusions

2. Multiple surgical interventions exist for the treatment of VO-CPP, which can be tailored depending on the SVP, endovascular options, and cause of patient symptoms. A multidisciplinary approach and discussion are recommended prior to any interventions.

There is a great need for more robust research and clinical trials to enhance evidence-based care for patients with VO-CPP. This includes better studies of the best way to diagnose the condition, studies evaluating its natural history, and investigations for the role of medical therapy such as flavonoids and hormones, optimal endovascular technique, and patient selection and comparative effectiveness trials of embolization, iliac vein stent insertion, and the various surgical approaches to understand the clinical outcome treatment. This will help provide an evidence-based approach to guide treatment for patients with VO-CPP.

Interventional radiologists are well positioned to aid in the treatment of patients with PeVD and VO-CPP. Ideally, clinical evaluation of women with CPP is performed in partnerships with colleagues in gynecology, vascular and transplant surgery, urology, gastroenterology, and mental health before treatment as well as for those women with persistent symptoms and impacts after effective venous therapy.

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